REMARKS

Claims 1-3, 6-13, 16-17, and 20-22 are pending in the application. Claims 4, 5, 14-15, 18-19, and 23-24 have been canceled. Claims 1, 6, 16, and 20 have been amended.

Applicants' responses to the issues raised in the Office Action are set forth below in the following discussion.

Anticipation Rejections Under 35 U.S.C. §102

The Examiner has rejected claims 1-24 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,475,904 to Okoroanyanwu et al. Further, claims 20, 21, 23, and 24 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,001,739 to Konishi. In addition, claims 20-21 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,613,665 to Catabay et al. The Examiner also rejected claims 1-24 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,042,993 to Leuschner et al. For the reasons explained below, Applicants respectfully assert that Okoroanyanwu et al., Catabay et al., Konishi, and Leuschner et al. '993 fail to identically disclose each and every feature specified in amended independent claims 1, 6, 16, and 20.

Independent claims 1, 6, 16, and 20 define methods for patterning a layer of a low dielectric constant material or a method for forming an integrated circuit. Although the Applicants believe that the original pending claims define over the art of record, the Applicants have amended independent claims 1, 6, 16, and 20 to further clarify that the surface imaging material has silicon incorporated therein, and that the hardening of the patterned surface imaging material includes exposing the patterned surface imaging material to an oxygen containing plasma. Before the hardening of the patterned surface imaging

material, it should be appreciated that the surface imaging material is applied on a layer of the low dielectric constant material.

In support of the 35 U.S.C. §102(e) and §102(b) rejections, the Examiner asserts that Okoroanyanwu et al., Catabay et al., and Konishi disclose that the surface imaging material has silicon incorporated therein, as defined in canceled dependent claims 5, 15, 19, and 24, which have been incorporated into independent claims 1, 6, 16, and 20, respectively. Applicants respectfully traverse the Examiner's characterization of Okoroanyanwu et al., Catabay et al., and Konishi relative to amended independent claims 1, 6, 16, and 20 because Okoroanyanwu et al., Catabay et al., and Konishi do not disclose that the surface imaging material has silicon incorporated therein. In particular, Catabay et al. do not disclose anywhere the incorporation of silicon in a surface imaging material. Okoroanyanwu et al. and Konishi disclose a separate silylation step to incorporate silicon into a photoresist layer. For example, Okoroanyanwu et al. disclose "a liquid silylation step is performed to incorporate silicon into the imageable layer" (column 6, lines 4-5). Instead of a separate silylation step to incorporate silicon, amended independent claims 1, 6, 16, and 20 specify that the surface imaging material already has silicon incorporated therein. In fact, Konishi discloses that "[t]he photoresist film is preferably formed of a phenol series resin containing *no silicon component*" (column 2, lines 47-48). Accordingly, Okoroanyanwu et al., Catabay et al., and Konishi cannot reasonably be considered to disclose one having ordinary skilled in the art the exposure of a patterned surface imaging material with silicon incorporated therein to an oxygen containing plasma to harden the patterned surface imaging material, as defined in amended independent claims 1, 6, 16, and 20.

Leuschner et al. '993 do disclose a photoresist that contains silicon (column 2, line 64). However, the Examiner also asserts that Leuschner et al. '993 disclose the application of

a surface imaging material on a layer of a low dielectric constant material, as defined in amended independent claims 1, 6, 16, and 20. Applicants respectfully traverse the Examiner's characterization of Leuschner et al. '993 relative to amended independent claims 1, 6, 16, and 20 because portions of the reference relied upon by the Examiner (column 2, line 59 – column 3, line 13) do not disclose a low dielectric constant material. Specifically, Leuschner et al. '993 disclose a bottom resist of amorphous hydrogenous carbon, and the Examiner asserts that this bottom resist is a low dielectric constant material. However, Leuschner et al. '993 specify that the resist material needs to have "sufficient electric conductivity" or "a sufficiently small optical energy gap" such that "low-energy electrons can be removed through the bottom resist layer" (column 3, lines 6 and 20-24). A low dielectric constant material is not characterized by having a sufficient electric conductivity. As Leuschner et al. '993 merely disclose a "two-layer resist system," Leuschner et al. '993 cannot reasonably be considered to disclose the application of a surface imaging material on a layer of a low dielectric constant material, as defined in amended independent claims 1, 6, 16, and 20 (column 2, line 60).

For the reasons set forth above, none of Okoroanyanwu et al., Catabay et al., Konishi, and Leuschner et al. '993 discloses each and every feature of the claimed invention. Accordingly, amended independent claims 1, 6, 16, and 20 are patentable under 35 U.S.C. §102(e) over Okoroanyanwu et al. and are patentable under 35 U.S.C. §102(b) over Leuschner et al. '993. Further, amended independent claim 20 is patentable under 35 U.S.C. §102(b) over Konishi and is patentable under 35 U.S.C. §102(e) over Catabay et al. Claims 2, 3, 7-13, 17, and 21-22, each of which depends from one of amended independent claims 1, 6, 16, or 20, are likewise patentable under 35 U.S.C. §102(b) and 35 U.S.C. §102(e) over Okoroanyanwu et al., Konishi, Leuschner et al. '993, and Catabay et al. for at least the same

reasons set forth above regarding the applicable independent claims. Accordingly, the anticipation rejections of pending claims 1-3, 6-13, 16-17, and 20-22 are improper and should be withdrawn.

Obviousness Rejections Under 35 U.S.C. §103(a)

Claims 3, 13, 17, and 22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Okoroanyanwu et al. in view of U.S. Patent No. 6,057,928 to Li et al. Further, claims 1, 2, 6-8, and 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Catabay et al. The Examiner additionally rejected claims 1-24 under 35 U.S.C. §103(a) as being unpatentable over Leuschner et al. '993 in view of U.S. Patent No. 6,287,961 to Liu et al. Further, claims 1-24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,556,812 to Leuschner et al. in view of U.S. Patent No. 6,096,634 to Nguyen. As will be fully explained below, Catabay et al. and the combinations of Okoroanyanwu et al. in view of Li et al., Leuschner et al. '993 in view of Liu et al., and Leuschner et al. '812 in view of Nguyen do not raise a *prima facie* case of obviousness against amended independent claims 1, 6, 16, and 20.

As discussed above, Okoroanyanwu et al. merely disclose a separate silylation step and do not disclose or suggest a surface imaging material that has silicon incorporated therein. Similarly, Leuschner et al. '812 do not disclose or suggest the use of a surface imaging material that has silicon incorporated therein in a two-layer system. Instead, like Okoroanyanwu et al., Leuschner et al. '812 disclose that the "resist structures created in this manner are silylated at room temperature for 3 min in an aqueous-alcoholic solution" (column 8, lines 29-31). Nguyen, Catabay et al., and Liu et al. do not disclose anywhere the incorporation of silicon in a surface imaging material. Accordingly, Okoroanyanwu et al., Leuschner et al. '812, Catabay et al., Nguyen, and Liu et al. cannot reasonably be considered

to disclose or suggest to one having ordinary skilled in the art the exposure of a patterned surface imaging material with silicon incorporated therein to an oxygen containing plasma to harden the patterned surface imaging material, as defined in amended independent claims 1, 6, 16, and 20.

Concerning the combination of Leuschner et al. '993 in view of Liu et al., the Examiner asserts that Leuschner et al. '993 in view of Liu et al. disclose or suggest the application of a surface imaging material on a layer of a low dielectric constant material, as defined in amended independent claims 1, 6, 16, and 20. Applicants respectfully traverse the Examiner's characterization of Leuschner et al. '993 and Liu et al. relative to amended independent claims 1, 6, 16, and 20 because portions of the references relied upon by the Examiner do not disclose or suggest a layer of a low dielectric constant material. As discussed above, Leuschner et al. '993 disclose that the resist material needs to have sufficient electric conductivity, and a low dielectric constant material is not characterized by sufficient electric conductivity. The Examiner also cites Liu et al. to show inherent properties of the amorphous hydrogenous carbon disclosed in Leuschner et al. '993. However, Liu et al. merely list "amorphous carbon dielectric materials" as examples of low dielectric constant dielectric materials (column 2, lines 6-7). The amorphous *hydrogenous* carbon disclosed in Leuschner et al. '993 does not equate to the amorphous carbon disclosed in Liu et al. In particular, the additional hydrogen(s) in the amorphous hydrogenous carbon distinguishes the amorphous hydrogenous carbon from a simple amorphous carbon. Therefore, Leuschner et al. '993 in view of Liu et al. cannot reasonably be considered to disclose or suggest the application of a surface imaging material on a layer of a low dielectric constant material, as defined in amended independent claims 1, 6, 16, and 20.

It should also be noted that with the Catabay et al. rejection, the Examiner asserts that a surface imaging material with a thickness in the range from about 500 angstroms to about 2,500 angstroms, as defined in amended independent claims 1, 6, and 16, is within the ordinary skill of one in the art. Applicants respectfully traverse the Examiner's assertion of official notice because one skilled in the art would not use such defined thickness of a surface imaging material on a low dielectric constant material. For instance, Leuschner et al. '812 discloses the use of a thicker 0.8μm (8,000 angstroms) silylatable resist (column 8, lines 19-20).

To establish a *prima facie* case of obviousness, the prior art references must disclose or suggest all the claim features. Here, in view of the incorrect characterization of Okoroanyanwu et al., Catabay et al., Li et al., Leuschner et al. '993, Li et al., Leuschner et al. '812, and Nguyen, the references as combined do not disclose all the features of the claimed invention. Accordingly, Applicants submit that amended independent claims 1, 6, 16, and 20 are patentable under 35 U.S.C. §103(a) over Okoroanyanwu et al. in view of Li et al., Catabay et al., Leuschner et al. '993 in view of Liu et al., and Leuschner et al. '812 in view of Nguyen. Claims 2, 3, 7-13, 17, and 21-22, each of which depends from one of amended independent claims 1, 6, 16, or 20, are likewise patentable under 35 U.S.C. §103(a) over Okoroanyanwu et al. in view of Li et al., Catabay et al., Leuschner et al. '993 in view of Liu et al., and Leuschner et al. '812 in view of Nguyen for at least the same reasons set forth above regarding the applicable independent claims. Accordingly, the obviousness rejections of pending claims 1-3, 6-13, 16-17, and 20-22 are improper and should be withdrawn.

Conclusion

In view of the foregoing, the Applicants respectfully request reconsideration and reexamination of pending claims 1-3, 6-13, 16-17, and 20-22, and submit that these claims

are in condition for allowance. Accordingly, a Notice of Allowance is respectfully requested. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 774-6924. If any additional fees are due in connection with the filing of this paper, then the Commissioner is authorized to charge such fees to Deposit Account No. 50-0805 (Order No. LAM1P111.CIP).

Respectfully submitted,
MARTINE PENILLA & GENCARELLA, L.L.P.

Michael K. Hsu, Esq.
Reg. No. 46,782

710 Lakeway Drive, Suite 200
Sunnyvale, California 94085
Telephone: (408) 774-6924
Customer Number 25920